ENVIRONMENTAL PHYSICS GROUP

# NEWSLETTER

No. 11 March 1995

THE INSTITUTE OF PHYSICS

*Contributions*

Contributions, news items or meeting notices are welcome from members and non-members alike and should be sent to:

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University of Oxford
Parks Road, Oxford OX1 3PJ
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e-mail: geoff.hassall@eng.ox.ac.uk

*EPG Membership*

IoP/EPG membership enquiries are encouraged from both physicists and non-physicists with an interest in topics in "Environmental Physics". For further details contact:

**The Membership Manager**

The Institute of Physics
47 Belgrave Square, London SW1X 8QX
Tel: (071) 235 6111 Fax: (071) 259 6002
e-mail: iop@uk.ac.ulcc





**Welcome to Issue number 11.**

First, and on behalf of the EPG Committee, may I wish all our members a belated happy new year. Perhaps that should be "happy Easter" because this issue certainly is "belated" and for that I apologise.

Of course, Easter-time should bring to mind that the **Annual General Meeting** will soon be with us. A date has not been fixed as yet but we can say that the speaker this year will be **John Monteith.** Further notices will be distributed when dates have been finalised. Current plans are for an AGM in May to be held at Belgrave Square in London. The attendence for previous AGMs has been disappointing and we would like to improve matters. How this can be done is a mystery and the solution to this mystery depends on **you**, the EPG membership. The lecturers are always first-rate, so what is it that prevents you from attending? Let us know and perhaps we can do something about it. In fact, this will be the fifth anniversary of the formation of the EPG and John Stewart has a few words to say about that in his piece on page 4. However, our concern at the moment is how we can involve the membership to a greater extent than we are able to at the moment. With this being an anniversary of note we would like to encourage some of you to take a more active role in the activities of the EPG both at a national or, more importantly, at a local level. Clearly, your input is essential.

**Back to issue 11.** In recent months we have been involved with the organisation of several meetings. The most important of these was held at Lancaster University early in January and was aimed at science teachers. Our Education Sub-Committee is doing stalwart work encouraging the A-level examining boards to accept Environmental Physics as part of their Physics courses and *significant* progress has been made. Cathy Wilson of the IoP Education Department and Peter Hughes tell us more in their meeting report on page 5.

The news items include a note about some new environmental guidelines for engineers from the **Engineering Council**, a note about the Engineering Council for those unfamiliar with this organisation, and a piece about the **British Atmospheric Data Centre.** They have a *world-wide-web* homepage and the address is included. The increased use of the Internet for information relevant to Physicists, such as data and jobs, has certainly expanded over the past few months. The **Times Higher** came on-line recently and so *web* users now have access to their jobs listings a couple of days before the paper version goes on sale. The URL is **http://www.timeshigher.newsint.co.uk/.** Happy job hunting!

As usual, any comments or contributions will always be welcome and should be sent to me at the address on the contents page.

**Geoff Hassall**
*Newsletter Editor*

## The EPG: Past, Present and Future

*We will soon be advertising our 1995 Annual General Meeting and as a prelude to that event our Chairman, John Stewart reflects on the EPG to date and how it should develop in the future.*

### The First Five Years

The first meeting of the Steering Committee to initiate the Environmental Physics Group met in May, 1990 and the Group was formally launched at the British Association for the Advancement of Science meeting in August 1992. Since then the membership has risen to over 400. We have put on a number of successful meetings, often jointly with other Groups and Societies. Following the initiative of the EPG's Education Sub-committee a draft syllabus for an Environmental Physics module for 'A' level physics was drawn up. Two examining boards have since taken up parts of the syllabus and the first students will be examined on this course in June 1996.

### The Next Five Years

We have always recognised that Environmental Physics covers a very wide range of topics. On the Committee which runs the EPG we cover some of these topics. However we feel that we need to extend the coverage by increasing the size of the Committee or co-opting on extra members. Since the current Committee's contacts are limited, we are inviting any of the membership who might be interested in joining the COmmittee to send in their name and address with a brief summary of their career. **Can you do this straight away** so that they may be considered before the AGM when the Committee for the coming year is elected ? The Committee meets 3 or 4 times a year at the Institute of Physics in London and expenses are paid by the IoP. Experience is not necessary, so we are hoping for a response from younger members of the EPG.

**John Stewart,** *(Chair EPG)*

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*One of our new co-opted members is Alex Wilson and she now gives us a brief resumé of her background. (Ed.)*

**Alexandra (Alex) Wilson** obtained a 2:1 in Physics at the University of East Anglia where she developed an interest in Environmental matters. This led her to take an MSc in 'Energy Conservation and the Environment' at Cranfield Institute of Technology.

For the last two years she has been working in the Research and Development Section of Ove Arup, Consulting Engineers. Her work includes the development of thermal computer models for buildings, which permit optimisation of energy consumption and comfort levels.

**Alex Wilson**
*Ove Arup & Partners, Research and Development.*



## Environmental Physics for Schools and Colleges:

### A day of activities for Science Teachers at the Premier event of their year.

At the 1995 Annual meeting of the **Association for Science Education,** held at Lancaster University in early January, the EPG collaborated with the Institutes Education Department to mount a day of activities for science teachers. There were three elements to the programme for the day: a tri-partite lecture presentation in the morning; an exhibition of mini-demonstrations, posters; computer simulations and hands-on experiments which ran through the day; and an afternoon workshop for A-level teachers and university lecturers.

The morning presentations focused on three different aspects of physics in the environment — *Wave Power Technology, Atmospheric Physics* and *Hydrology.* In the time period available no lecturer was able to give a truly comprehensive picture of his field. However, each started a very valuable outline and among the many other points brought home to the audience was the sheer scope of the field which environmental physics represents.

**Professor Trevor Whittaker** gave an excellent and energetic over-view of technology from wave resource to the supply of electricity, and with slides to bring the venture alive, described in more detail the Islay project and the future potential of the technology.

**Dr David Rees** made clear the critical importance of an accurate knowledge of the complex and highly variable motions of the atmosphere - for weather forecasting, and for investigations of the processes which drive the atmosphere motions , and the chemical processes involved in the dispersal of oxone or pollutants. One slide in particular gave one more sympathy for the weather forecasters one October night in 1987, showing as it did three different "pictures" of developing conditions resulting from three different authentic forms of measurement of the wind conditions.

**Dr John Stewart** took the audience into very different climatic conditions and ecosystems, those of the Sahel regions bordering the deserts of Niger. He explained how environmental physicists had been measuring and modelling the evaporation from natural vegetation and agricultural crops in order to assess the effects on the hydrological cycle of reductions in vegetation due to increasing populations and changing patters of agriculture, this with a view to advising on improved farming practices. In the course of his talk he gave an interesting account of how he became involved in environmental physics, the nature of the work of an environmental physicist in general and how his particular career had progressed.

*Three very different and three very informative presentations - with fascinating insights*

*to a very diverse and very globally, economically relevant field of endeavour.*

The **exhibition** included a wide range of displays which again emphasised the cross-disciplinary nature of work in this area. For example:

**LACR Rothamsted** illustrated two forms of samplers used in the measurement of the biological particles in the air which can cause diseases in crops and respiratory diseases in people. The role of physicists in understanding aerobiological processes and in developing measurement and monitoring equipment was thus shown.

**The Proudman Oceanographic Laboratory** showed two aspects of oceanography — the principles of satellite altimetry (measuring sea levels from space), and the use of Ocean Surface Current Radar systems and the Acoustic Doppler Current Profiler for water flow measurements. The former measurements are required for the validation of global and regional tide and circulation models.

**Manchester Metropolitan University** arranged a demonstration of work being done there using ozone data from NASA CD-ROMs (with handouts on ozone measurements) and software written to access other NASA CDs, mainly concerned with planetary data.

There were also displays from the Institute of Hydrology on surface temperature measurements from the ground and from satellites, from the Open University Energy from the Environment Research Unit of their very newly launched Renewable Energy Resource Pac, several from the School of Environmental Sciences at Lancaster University on a variety of topics. *Some of these were further developed in the afternoon workshop.*

The **workshop** was a two hour session for A-level Physics teachers and university lecturers. It consisted of three components: an **introduction** by Peter Hughes; **four hands-on activity stations**; and a **plenary session** which involved audience participation. Its aim was to provide A-level Physics teachers with an insight into and a flavour of the exciting nature of Environmental Physics. To do this three **objectives** were defined:

- To introduce the main themes in Environmental Physics, as depicted in the syllabuses of the London Board ("Earth and Atmosphere") and the Oxford and Cambridge Structured Science Scheme ("Physics in the Environment").
- To provide four stations that reflect various Environmental Physics themes, and which will stimulate teachers to replicate 'hands-on' activities in the classroom.
- To provide a plenary for teachers' comments and actions to be taken in support of teacher takeup of the subject.

The **Introduction** gave an overview of the breadth of Environmental Physics, and it was pointed out that aspects of Environmental Physics are now part of the A-level Physics programmes of several examination boards. Pilot curriculum materials are being developed



by the Institute of Physics' A-level Environmental Physics Working Group, in support of the teaching and learning of the subject, which will be examined for the first time in June, 1996. It is envisaged that further exam boards will integrate elements of Environmental Physics into their programmes.

The **four activity stations** included:

- **Atmospheric Physics**: Dr Robin McIlveen (Lancaster University).
  Cloud formation in bottles and the Coriolis effect.
- **Remote Sensing**: Dr Craig Underwood (Surrey University).
  Major current earth observation satellites and applications, including live reception of satellite image data.
- **Geophysics**: Dr Philip Meredith (University College London) and Mr Alan Burgess (Kingsway College).
  P- and S- wave velocities and earthquake data on CD-ROM.
- **Environmental Monitoring and Instrumentation**: Mr Ray Davies (Manchester Grammar School).
  Aspects of spectroscopy and laser interferometry.

The **plenary** session was also attended by **Dr John Stewart** (Chair., EPG) and **Dr David Hartley** (Subject Officer for A-level Physics for the London Board). The audience was asked to respond to the following themes: lessons to be drawn; issues arising and comments; and what more can be done to support teachers and students?

This was the first occasion on which 'A" level Physics teachers were introduced to practical Environmental Physics and the feed-back received was very positive. The teachers enjoyed what they saw and heard, and found the components lively and exciting. Several said that the INSET workshop was excellent, and one considered it the best experience in two days at the conference. The majority indicated an interest in wishing to teach the subject.

Both John and David made valuable contributions, and John posed the question - would teachers be interested in attending an IoP-sponsored meeting on "Environmental Physics in solving problems". The audience was very interested and desired that their sixth-formers should also be included. It was felt that the Workshop had been a great success, and all were interested in receiving copies of the draft curriculum materials for inspection.

Our sincere thanks go to the station specialists who gave their time and energy. Finally, I would like to thank Catherine Wilson and Chris Butlin for organizing a splendid Environmental Physics Day.

**Cathy Wilson**, *IoP Education Department*
**Peter Hughes**, *Chair, EPG Education Sub-Committee.*

## The Engineering Council:

**Guidelines on Environmental Issues** *(Engineering Council, 1994)*

These guidelines are intended primarily as a helpful source of reference for the diverse engineering profession. As stated, the scope covers:

- The Environment and Human Activity
- Sustainable Development
- Environmental Principles
- The Business Case for Protecting the Environment

For information and copies of this publication contact:

**The Engineering Council**
*10 Maltravers Street*
*London WC2R 3ER*
*Tel: 0171 240 7891; Fax: 0171 240 7517*

*Some of our Members are perhaps unfamiliar with* **The Engineering Council** *and what it stands for so, for your information, here's what it says on the back cover. (Ed.)*

"**The Engineering Council** was established by Royal Charter on 27 November, 1981 with one of its objects being

> *... to advance education in, and to promote the science and practice of engineering (including the relevant technology) for the public benefit and thereby to promote industry and commerce ...*

The Engineering Council's aims include:

- Increasing awareness of the essential and beneficial part engineering plays in all aspects of modern life.
- Spreading best engineering practices to improve the efficiency and competitiveness of UK businesses.
- Advancing engineering knowledge through education and training.

The Engineering Council seeks to achieve these aims by:

- Encouraging all registrants, comprising Chartered Engineers, Incorporated Engineers and Engineering Technicians to take part in the United Kingdom's affairs at the national level and to promote, specifically with employers, the recognition of their value and contribution.



- Encouraging fresh approaches to educational courses and training programmes with particular emphasis on interdisciplinary aspects.
- Stressing the need for a proper balance between efficiency, public safety and the needs of the environment when carrying out engineering activities.
- Issuing, from time to time, Codes of Practice laying down the principles to be followed by registrants of The Engineering Council in particular fields of activity."

*So now you know !*

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## The UK GER Office Newsletter: The Globe

Issue 23 (January, 1995) of the UK GER Newsletter, **The Globe**, has just arrived on my desk and contains several articles of interest to EPG members. The main theme is *Land Use and Global Environmental Change* and deals with the nature and relevance of changes in land use patterns on global environmental issues. Four articles are included:

- *Land Use and Hydrology*
  **James Blackie** and **Brian Wilkinson** (NERC Centre for Ecology and Hydrology, Wallingford, Oxon)
- *Interdisciplinary Perspectives on Land Use Changes and Global Warming*
  **Neil Adger** and **Katrina Brown** (Centre for Socio-Economic Research on the Global Environment (CSERGE), University of East Anglia and University College London).
- *A European Land Classification*
  **Bob Bunce** (Institute of Terrestrial Ecology, Merelwood).
- *Land Use Planning as an Instrument of Sustainable Development*
  **Susan Owens** (Department of Geography, University of Cambridge).

The next issue of **The Globe** will be available in March and will be a **Climate Change Special**. Further information and copies of the Globe, as well as details about other activities of the UK GER, contact:

**The UK GER Office**
*Polaris House,*
*North Star Avenue,*
*Swindon SN2 1EU*
*Tel: 01793 411768/411779 ;Fax: 01793 444513*

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### The British Atmospheric Data Centre

*Rutherford Appleton Laboratory, Oxon*

Facilities to aid researchers in environmental sciences in the UK often come to our notice and I think it worthwhile to show EPG members how the job of the Environmental physicist is being assisted through the construction of specialist data centres. The BADC is one such example.

Every organisation these days has one, and the BADC is no exception. So here it is, **The mission statement of the BADC:**

*"To provide access to data of the atmosphere and associated data required for atmospheric research in a timely and straightforward manner, together with sufficient information about the data, to enable the effective and efficient use of the data for research purposes."*

The **BADC** is funded by NERC and is one of NERC's designated data centres but it is not run by NERC staff. IT is sited in the Space Science Department of the Rutherford Appleton Laboratory and members may already know of its existence under its original title, the Geophysical Data Facility. This was run by SERC until its demise in April 1994, when NERC took over responsibility for it.

For further information about the BADC contact either **Peter Allan**, Project Manager of the British Atmospheric Data Centre and is Head of the Earth Observation Data Group at the Rutherford, or **Lesley Gray**, the Project Scientist. Members attending the EPG meeting at Congress'94 will remember her fascinating talk about the physics involved in the formation of the "Ozone holes" over the Arctic and Antarctic regions of the Earth.

**Peter Allan** *Tel: 01235-445723; Fax: 01235-445848; E-mail: P.M.Allan@rl.ac.uk*

**Dr. Lesley Gray** *Tel: 01235-446745; Fax: 01235-445848; E-mail: L.J.Gray@rl.ac.uk.*

**British Atmospheric Data Centre**
*Space Science Department*
*Rutherford Appleton Laboratory*
*Chilton, Didcot, Oxon OX11 0QX*

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*Anyone with access to the Web should take a look at the homepage for the BADC at* **http://www.badc.rl.ac.uk/**. *It includes a listing of people to contact and the information available. Examples of a wide range of atmospheric data such as* **TOMS** *(Total Ozone Mapping Spectrometer) and UK Met Office Assimilated Data are available. More general information about the* **Rutherford Appleton Laboratory** *can be found at* **http://www.rl.ac.uk/**. *(Ed.)*



### Electro-technologies for Waste Processing and Purification

*The Institute of Electrical Engineers, Savoy Place, London*

**23 November, 1994**

This was a collaborative effort between the Institute of Electrical Engineers (IEE), the Environmental Physics Group and the Plasma Physics Group of the Institute of Physics. Its objective was to identify industrial and commercial technologies and to assess their suitability as future energy efficient waste processing and purification of solids, liquids and gases. Between 45 - 50 attended and many of the presentations produced stimulating discussions regarding the true viability of such systems. The full programme of events included the following presentations:

- *Waste Management*
  **N Lawrence** (Clean Technologies Unit, EPSRC)
- *Plasma and Electrical Systems in Glass Manufacturing*
  **D Dalton** (British Glass)
- *Modelling of plasma systems*
  **G Lister** (Central Research Laboratories (Thorn EMI))
- *Use of electrical systems for water treatment*
  **B Buchanan** (Thames Water)
- *Ozone generation by pulsed corona discharge in wire cylinder arrangement*
  **I D Chalmers** (University of Strathcylde)
- *High rep-rate generator for pulsed capacitive discharges*
  **G Hassall** (University of Oxford)
- *Plasma Pyrolysis-liquid destruction*
  **M Copsey** (EA Technology)
- *Plasma Treatment of hospital waste*
  **L C Campbell** (University of Strathclyde)
- *Radio frequency and microwave processing*
  **A Metaxis** (University of Cambridge)

With the current concern about the release of hazardous and toxic materials into the environment, novel and energy efficient technologies must be sought to deal with pollutants materials resulting from industrial activity. The presentations in this meeting went part way to demonstrating that alternatives do exist and are being implemented provided that there is a will to do so from industry.

**Geoff Hassall**

## EPG Meetings:

**Urban Air Quality Meeting: Preliminary Announcement** **September, 1995**

As concern for the quality of the air we breath in the urban environment escalates, it has become all to clear that there is a desperate need for a better understanding of the underlying processes governing the formation and transport of airborne pollutants in and around our major conurbations. The pollution episodes occurring in many of our towns and cities this summer have amply demonstrated the potential health and social implications of poor urban air quality. The urban environment is becoming an important issue both scientifically and politically and there is increasing pressure on industry and commerce to comply with UK and EU air quality standards.

It is intended that this meeting will provide a forum for the discussion of recent scientific advances in the monitoring and modelling of urban air quality and how these can help our understanding of its impact on human health. However, it is essential to include the policy and decision makers who develop and implement air quality management strategies that will inevitably affect our everyday lives in the future city environment.

Our proposed outline for the meeting will include a wide range of topic areas suggested by these objectives. Four main headings are proposed.

- **The assessment of urban air quality** – Monitoring of all pollutants in the gaseous and particulate phase; sampling techniques and instrumentation; analytical aspects and emissions inventories.
- **Prediction of urban air quality** – Dispersion modelling; source apportionment (receptor) modelling; modelling developments (mathematical and statistical) and applications; physical and chemical processes in the boundary layer.
- **The Impact on environmental health** – Air pollution related illnesses; epidemiological studies; exposure estimates.
- **The Management and sustainability of urban air quality** – Policy issues; local and Government initiatives; evaluation of pollution control policies; integrated air quality management strategies.

The meeting will be composed of oral and poster presentations and it is hoped that the proceedings will be published either as a special issue of a journal or as a book. A call for abstracts will be announced in the very near future with the second call for papers following early in the new year. This is an important subject which affects us all and so we encourage all those with an interest to help us make this meeting a success.

**Geoff Hassall** and **Ranjeet Sokhi**
*Environmental Physics Group Committee*



## Other Meetings:

**Sampling and Rapid Assay of Bioaerosols** **14 June, 1995**
*Venue: Fowden Conference Hall, Rothamsted Experimental Station.*

This one-day meeting is being organised by **The British Aerobiology Federation** and **The Aerosol Society** and is sponsored by the **DTI Chemicals and Biotechnology Division**. The day is composed of 11 presentations and some are part of a DTI Seminar on Rapid Assay Methods. There is no fee for this special joint meeting, however places are limited and admittance will be by ticket only.

Further information can be obtained from:

**The Aerosol Society**
*P.O. Box 34,*
*Portishead, Bristol BS20 9NR*
*Tel: (01275) 843357; Fax: (01275) 817428*

**ECAMP 5** **3 – 7 April, 1995**
**The Fifth European Conference on Atomic and Molecular Physics**
*Venue: Edinburgh*

This is a conference devoted to atomic, molecular and laser spectroscopy, and electron, ion positron-atom/molecule collisions. It will incorporate special sessions on chemical physics, collisions on surfaces, cluster physics and recombination processes. The programme will consist of invited plenary talks, review and progress reports with the opportunity for 'hot topic' presentations selected from those abstracts submitted for poster presentation. A commercial exhibition will also be held at the conference site.

Ecamp 5 is held jointly with the 1995 Spring meetings of the Atomic, Molecular and Optical Physics section of the Institute and of the FV Atomphysik and FV Molekulphysik of the German Physical Society. ECAMP 5 will also include the 1995 meeting of the European Group for Atomic Spectroscopy (EGAS).

For further information contact:

**Dr N J Mason**
*Secretary ECAMP 5*
*Dept. of Physics and Astronomy,*
*University College London, Gower St.,*
*London WC1E 6BT*
*Tel: (0171) 380 7797; Fax: (0171) 380 7145*

**Sensors and their Applications VII** **10 – 13 September, 1995**

*Venue: Dublin*

This Conference has been organised by **The Instrument Science and Technology Group** of the Institute and is to take place at University College Dublin. This is now a well established event and has been supported by industry, government laboratories and higher education establishments over its history.

Interest in sensor development has grown steadily over recent years, with an increasing acknowledgement of the important role that sensor systems will have to play in the technology -dependent world of the next century. The aim of this meeting is to provide participants with an overview of recent developments in the wide range of fields covered by sensors, as well as providing an in-depth coverage of the latest work.

For further information contact:

**Sensors and their Applications VII**
*Meetings and Conferences*
*The Institute of Physics,*
*47 Belgrave Square,*
*London SW1X 8QX*
*Tel: (0171) 235 6111; Fax: (0171) 823 1051*

**British Council International Seminar** **2 - 8 April, 1995**
**Environmental Change: Policy, Planning and Management.**
*Venue: Oxford*
Further information from:
*Publicity Manager, International Seminars Department*
*The British Council,*
*10 Spring Gardens,*
*London SW1A 2BN*
*Tel: 0171 389 4264/4162/4226, Fax: 0171 389 4154*

**Energy and the Global Environment:** **12 - 16 June, 1995**
**Prospects for Sustainable Growth.**
*Venue: Wiston House Conference Centre, West Sussex*
Further information from:
*Elizabeth Harris*
*Wilton Park Conferences, Wiston House Conference Centre,*
*Steyning, West Sussex BN44 3DZ*
*Tel: 0903 815020, Fax: 0903 815931*



**Greenhouse Gases: Mitigation Options** **22 – 25 August, 1995**
*Venue: London*
For further information contact the Society at:
**Greenhouse Gases R & D Programme,**
*Mitigation Options Conference,*
*CRE, Stoke Orchard,*
*Cheltenham, Glos. GL5 4RZ*
*Tel: 0242 680753 ; Fax: 0242 680758*

**RSS '95: Remote Sensing in Action** **11 – 25 September, 1995**
**The 21st Annual Conference and Exhibition of the Remote Sensing Society**
*Venue: University of Southampton*
For further information contact the Society at:
**Department of Geography**
*The University, Nottingham NG7 2RD*
*Tel: (0115) 951 5435; Fax: (0115) 951 5249*

**Oceanology International '96:** **5 – 8 March, 1996**
**The Global Ocean - Exhibition and Conference**
*Venue: Brighton*
For further information contact:
**Spearhead Exhibitions Ltd.,**
*Ocean House,*
*50 Kingston Road, New Malden*
*Surrey KT3 3LZ*
*Tel: 0181 949 9222; Fax: 0181 949 8186*

**Implications of "Global Environmental Change"** **1 – 3 April, 1996**
**for Crops in Europe: A Multidisciplinary Conference.**
*Venue: Churchill College, Cambridge*
For further information contact:
**Professor T H Thomas**
*Broom's Barn Experimental Station,*
*Higham, Bury St. Edmunds,*
*Suffolk IP28 6NP*
*Tel: 0284 810363; Fax: 0284 811191*

**Chairman:**

Dr John Stewart — Remote Sensing Application Section,
Institute of Hydrology,
Wallingford, Oxon OX10 8BB
Tel: (0491) 838800 Fax: (0491) 832256

**Vice Chairman:**

Dr Douglas Peirson — (*formerly* Environment and Medical Sciences Dept., Harwell)
18 Nuneham Square,
Abingdon, Oxon OX14 1EH
Tel: (0235) 520454

**Honorary Secretary:**

Dr Alistair McCartney — Plant Pathology Department,
Rothamsted Experimental Station,
Harpenden, Herts AL5 2JQ
Tel: (0582) 763133 Fax: (0582) 760981

**Members:**

| | |
|---|---|
| Dr Peter Dagely | Department of Earth Science, University of Liverpool |
| Dr Geoff Hassall | Department of Engineering Science, University of Oxford |
| Mr Peter Hughes | Science Department, Kingsway College |
| Dr Neil Roberts | Magnetic Resonance Research Centre, University of Liverpool |
| Dr Mike Smithson | Proudman Oceanographic Laboratory, Bidston Observatory, Birkenhead |
| Dr Ranjeet Sokhi | School of Environmental Sciences, University of Greenwich |
| Dr Anne Wheldon | Energy Group, Department of Engineering, University of Reading |
| Professor Edward Youngs | Silsoe College, Cranfield Institute of Technology |

**Co-opted Members:**

| | |
|---|---|
| Peter Arnold | |
| Alex Wilson | Ove Arup & Partners, Research and Development |